US 20030233372A1

(19) United States

(12) Patent Application Publication (10) Pub. No.: US 2003/0233372 A1

Warner et al. (43) Pub. Date: Dec. 18, 2003

(54) MARKUP WORKFLOW MANAGEMENT SYSTEM

(76) Inventors: **Scott Jacob Warner**, Hopkinton, MA (US); **James Michael Hudson**, Shrewsbury, MA (US); **Robert Bradford Chase**, Windham, NH (US); **Krishnan Padmanabhan**, Framingham, MA (US); **Gary Charles Kline**, Medway, MA (US); **David Nuri Akdikmen**, Westborough, MA (US)

Correspondence Address:
FISH & RICHARDSON PC
225 FRANKLIN ST
BOSTON, MA 02110 (US)

(21) Appl. No.: **10/171,172**

(22) Filed: **Jun. 13, 2002**

Publication Classification

(51) **Int. Cl.**[7] **G06F 7/00**

(52) **U.S. Cl.** **707/104.1**

(57) ABSTRACT

A computer-implemented method includes rendering a web page in a browser control in a user interface; detecting user input that selects a portion of the web page; presenting a dialog in the user interface that detects user input of a markup to the portion of the web page; and specifying a collection of users to notify of the markup. The method can also include generating a task entry that specifies the selected portion of the web page, the markup, and the collection of users to notify. The task entry can also specify one or more of the following: 1) a copy of the web page, 2) the user that provided the user input, and 3) the approximate time that the user input was detected.

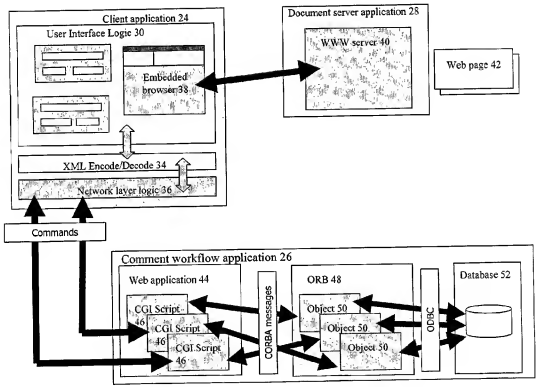


FIG. 1

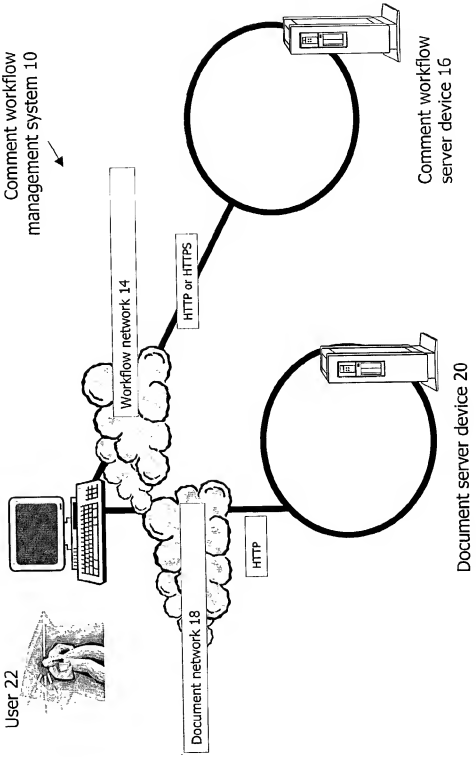

Comment workflow management system 10
Client device 12
User 22
Workflow network 14
Document network 18
HTTP or HTTPS
HTTP
Comment workflow server device 16
Document server device 20

FIG. 2

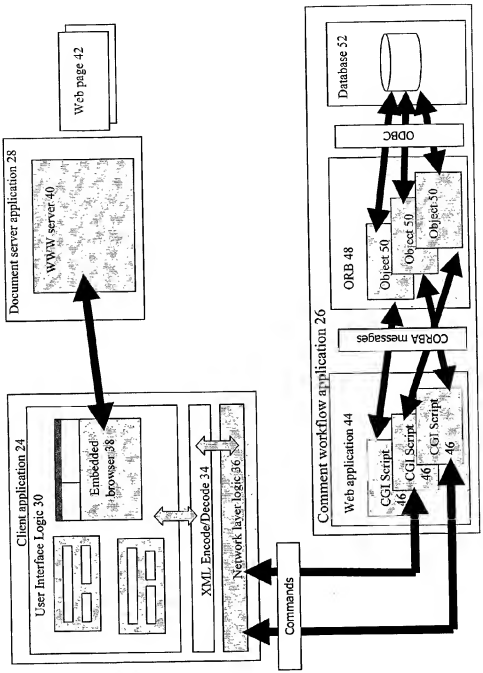

Client application 24
User Interface Logic 30
Embedded browser 38
XML Encode/Decode 34
Network layer logic 36
Commands
Document server application 28
WWW server 40
Web page 42
Comment workflow application 26
Web application 44
CGI Script 46
CGI Script 46
CGI Script 46
CORBA messages
ORB 48
Object 50
Object 50
Object 50
ODBC
Database 52

FIG. 3

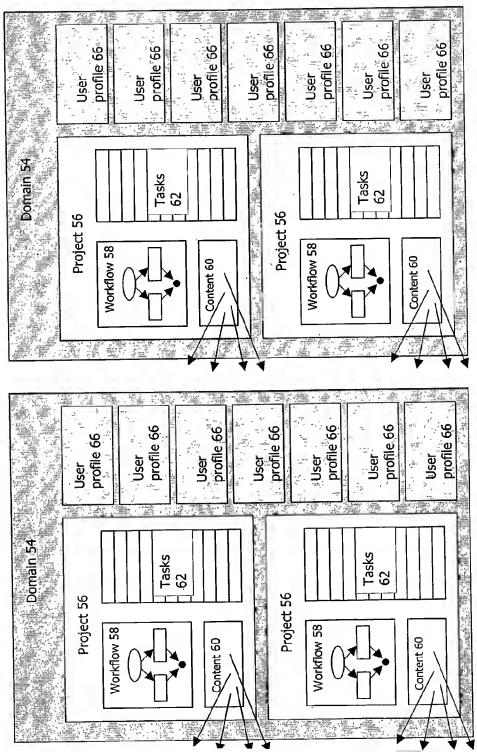

Domain 54
Project 56
Workflow 58
Tasks 62
Content 60
User profile 66
Domain 54
Project 56
Workflow 58
Tasks 62
Content 60
User profile 66

FIG. 4A

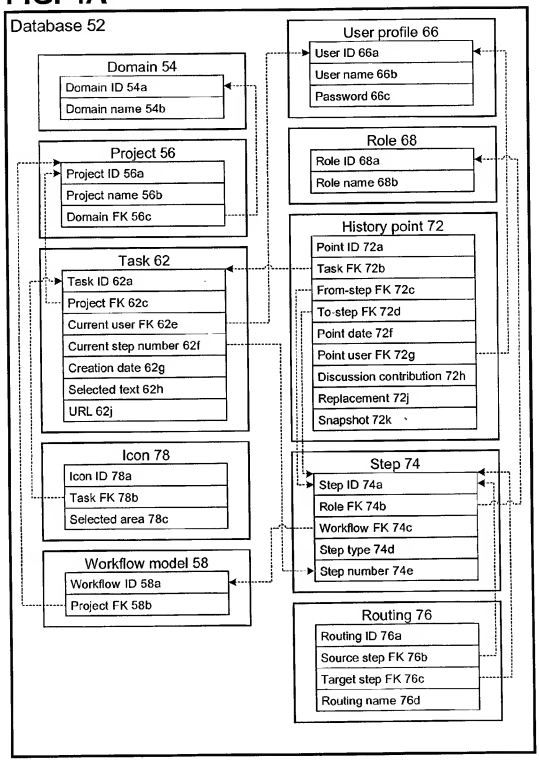

Database 52
Domain 54
Domain ID 54a
Domain name 54b
User profile 66
User ID 66a
User name 66b
Password 66c
Project 56
Project ID 56a
Project name 56b
Domain FK 56c
Role 68
Role ID 68a
Role name 68b
History point 72
Point ID 72a
Task FK 72b
From-step FK 72c
To-step FK 72d
Point date 72f
Point user FK 72g
Discussion contribution 72h
Replacement 72j
Snapshot 72k
Task 62
Task ID 62a
Project FK 62c
Current user FK 62e
Current step number 62f
Creation date 62g
Selected text 62h
URL 62j
Icon 78
Icon ID 78a
Task FK 78b
Selected area 78c
Step 74
Step ID 74a
Role FK 74b
Workflow FK 74c
Step type 74d
Step number 74e
Workflow model 58
Workflow ID 58a
Project FK 58b
Routing 76
Routing ID 76a
Source step FK 76b
Target step FK 76c
Routing name 76d

FIG. 4B

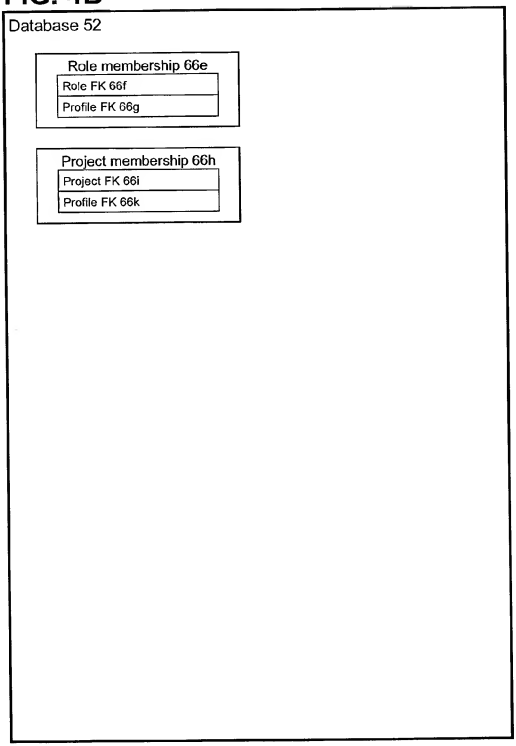

Database 52
Role membership 66e
Role FK 66f
Profile FK 66g
Project membership 66h
Project FK 66i
Profile FK 66k

FIG. 5

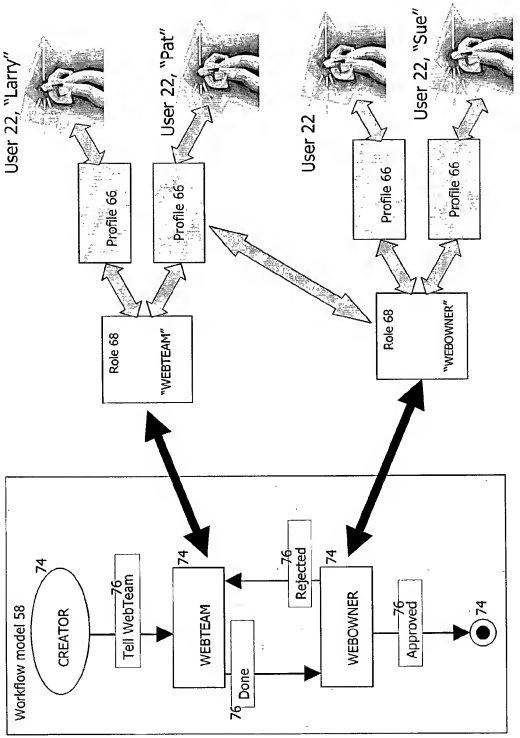

User 22, "Larry"
User 22, "Pat"
User 22
User 22, "Sue"
Profile 66
Profile 66
Profile 66
Profile 66
Role 68
"WEBTEAM"
Role 68
"WEBOWNER"
Workflow model 58
CREATOR
74
Tell WebTeam
76
WEBTEAM
74
Done
76
Rejected
76
WEBOWNER
74
Approved
76
74

FIG. 6

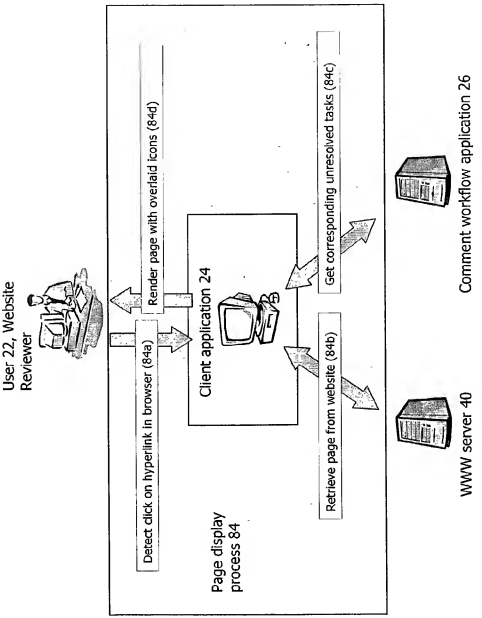

User 22, Website Reviewer
Detect click on hyperlink in browser (84a)
Render page with overlaid icons (84d)
Client application 24
Page display process 84
Retrieve page from website (84b)
Get corresponding unresolved tasks (84c)
WWW server 40
Comment workflow application 26

FIG. 7

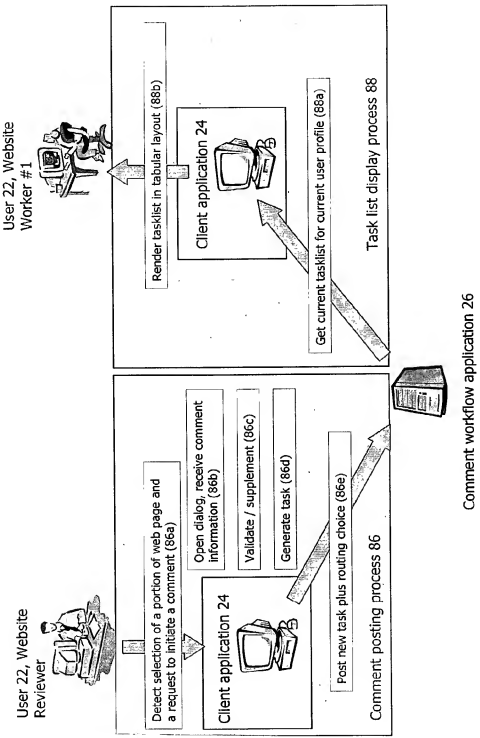

User 22, Website Reviewer
Detect selection of a portion of web page and a request to initiate a comment (86a)
Client application 24
Open dialog, receive comment information (86b)
Validate / supplement (86c)
Generate task (86d)
Post new task plus routing choice (86e)
Comment posting process 86
User 22, Website Worker #1
Render tasklist in tabular layout (88b)
Client application 24
Get current tasklist for current user profile (86a)
Task list display process 88
Comment workflow application 26

FIG. 8A

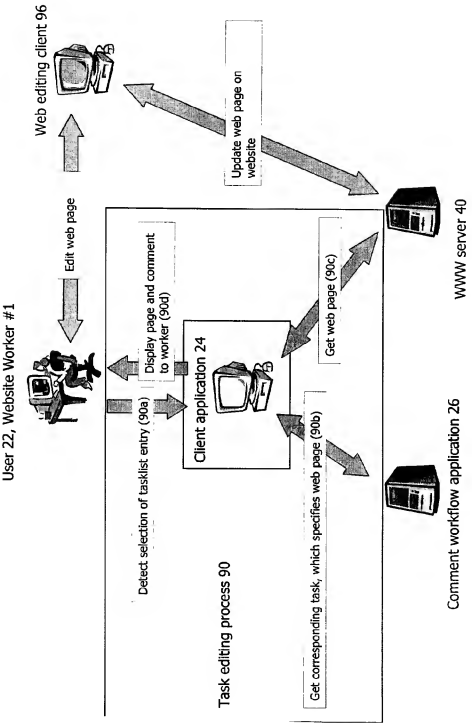

User 22, Website Worker #1
Edit web page
Web editing client 96
Update web page on website
Detect selection of tasklist entry (90a)
Display page and comment to worker (90d)
Client application 24
Task editing process 90
Get corresponding task, which specifies web page (90b)
Get web page (90c)
WWW server 40
Comment workflow application 26

FIG. 8B

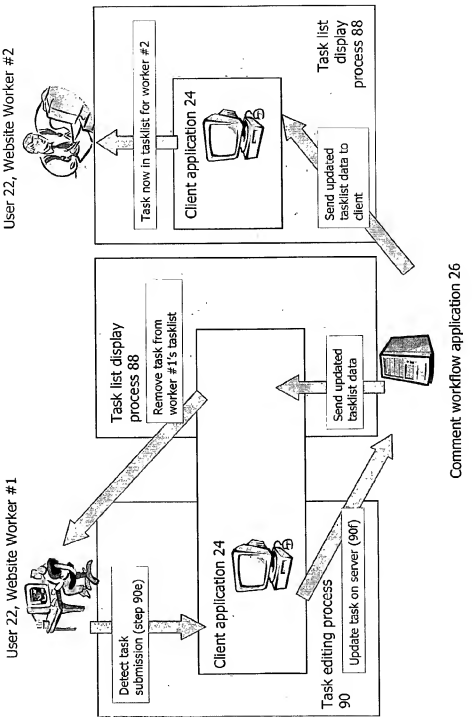

User 22, Website Worker #1
Detect task submission (step 90e)
Client application 24
Task list display process 88
Remove task from worker #1's tasklist
Task editing process 90
Update task on server (90f)
Send updated tasklist data
Comment workflow application 26
User 22, Website Worker #2
Task now in tasklist for worker #2
Client application 24
Task list display process 88
Send updated tasklist data to client

FIG. 9

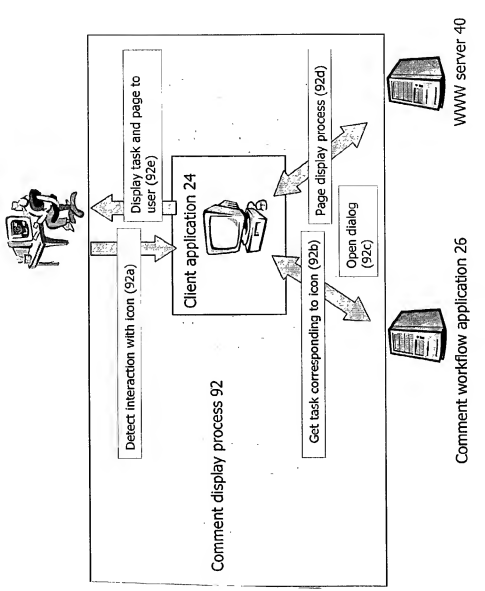

User 22
Comment display process 92
Detect interaction with icon (92a)
Display task and page to user (92e)
Client application 24
Get task corresponding to icon (92b)
Open dialog (92c)
Page display process (92d)
Comment workflow application 26
WWW server 40

FIG. 10A

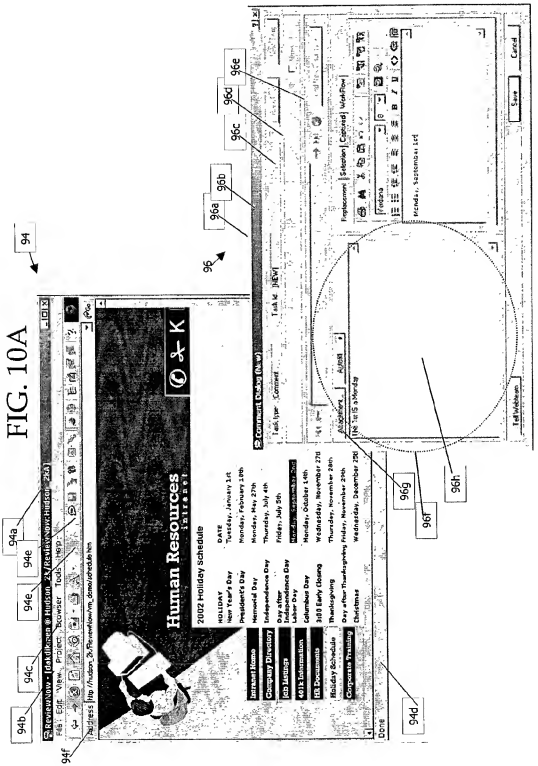

94
94a
94b
94c
94d
94e
94f
94g
94h
96
96a
96b
96c
96d
96e
96f
96g
96h
Human Resources
2002 Holiday Schedule
Internet Home
Company Directory
Org Listings
401k Information
HR Documents
Holiday Schedule
Corporate Training
Tuesday, January 1st
Monday, February 18th
Monday, May 27th
Thursday, July 4th
Friday, July 5th
Monday, October 14th
Wednesday, November 27th
Thursday, November 28th
Friday, November 29th
Wednesday, December 25th
Comment Dialog (NEW)
Task Name
Comment
Task Id
(NEW)
Subject
Cancel
Save

FIG. 10B

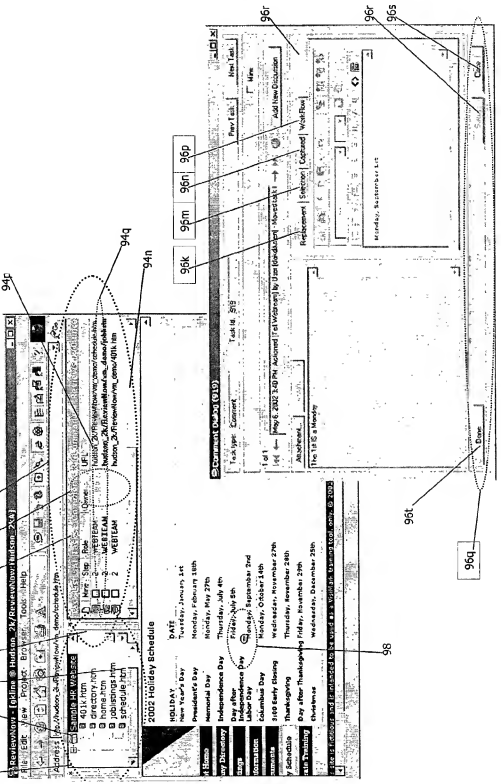

94g
94k
94i
94j
94m
94r
94h
94p
94q
94n
96k
96m
96n
96p
96r
96s
96t
96q
98
2002 Holiday Schedule
DATE
HOLIDAY
New Year's Day
Tuesday, January 1st
President's Day
Monday, February 18th
Memorial Day
Monday, May 27th
Independence Day
Thursday, July 4th
Labor Day
Monday, September 2nd
Columbus Day
Monday, October 14th
Veterans Day
Tuesday, November 12th
Thanksgiving Day
Thursday, November 28th
Day After Thanksgiving
Friday, November 29th
Christmas
Wednesday, December 25th
Comment Entry (010)
Holiday Schedule

FIG. 10C

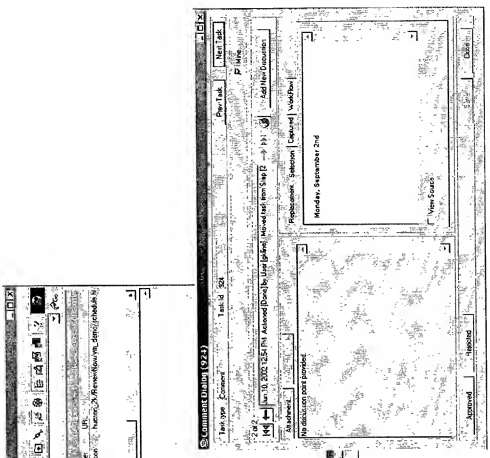

2002 Holiday Schedule
HOLIDAY
DATE
New Year's Day
Tuesday, January 1st
President's Day
Monday, February 18th
Memorial Day
Monday, May 27th
Independence Day
Thursday, July 4th
Day after Independence Day
Friday, July 5th
Labor Day
Monday, September 2nd
Columbus Day
Monday, October 14th
Mid Early Closing
Wednesday, November 27th
Thanksgiving
Thursday, November 28th
Day after Thanksgiving
Friday, November 29th
Christmas
Wednesday, December 25th
Comment
Task Id
Task type
Next task
Add Next Discussion
Monday, September 2nd
Vote Scores
No discussion post provided.

FIG. 10D

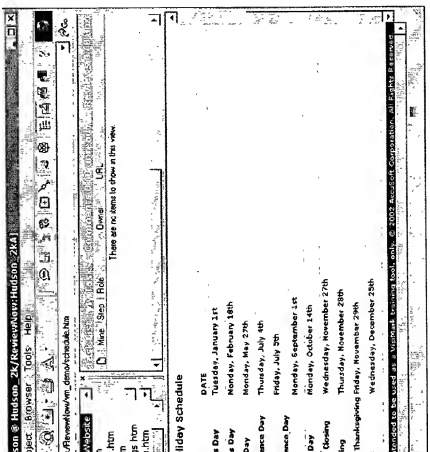

ReviewNow - [Hudson @ Hudson_2K/ReviewNow Hudson 2K4]
File Edit View Project Browser Tools Help
Address http://hudson_2k/ReviewNow_demo/schedule.htm
Sample HR Website
401k.htm
directory.htm
home.htm
payroll.htm
schedule.htm
URL
Mine Seq Role Owner
There are no items to show in this view.
2002 Holiday Schedule
HOLIDAY
DATE
New Year's Day
Tuesday, January 1st
Presidents' Day
Monday, February 18th
Memorial Day
Monday, May 27th
Independence Day
Thursday, July 4th
Labor Day
Monday, September 1st
Columbus Day
Monday, October 14th
Thanksgiving
Thursday, November 28th
Day after Thanksgiving
Friday, November 29th
Christmas
Wednesday, December 25th
Done

FIG. 10E

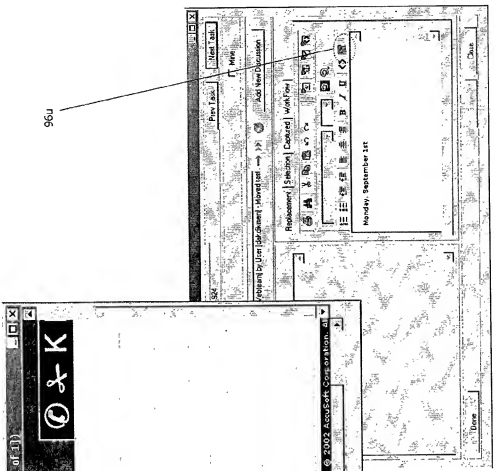

Original And Replacement Preview [ID = 92413 of 1]
uman Resources
Intranet
002 Holiday Schedule
HOLIDAY
DATE
ew Year's Day
Tuesday, January 1st
esident's Day
Monday, February 19th
emorial Day
Monday, May 27th
dependence Day
Thursday, July 4th
by after dependence Day
Friday, July 5th
bor Day
Monday, September 1st
lumbus Day
Monday, October 14th
08 Early Closing
Wednesday, November 27th
anksgiving
Thursday, November 28th
by after Thanksgiving
Friday, November 29th
ristmas
Wednesday, December 25th
Proposed
Original
Page rendered with proposed changes
96v
96w
96u

FIG. 11A

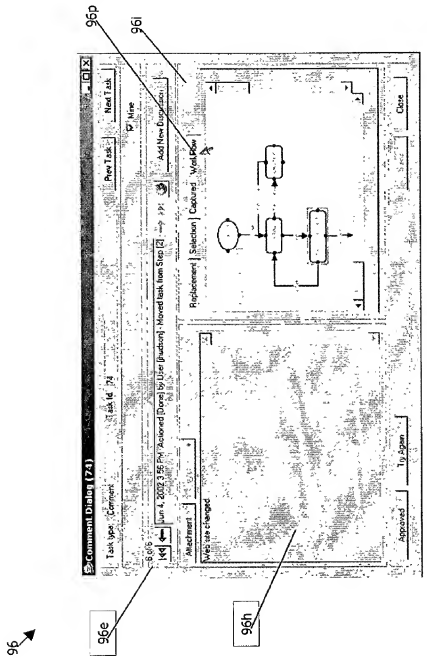

96
96e
96h
96p
96i
Comment Dialog (74)
Next Task
Prev Task
Add New Function
Approved
Try Again
Close

FIG. 11B

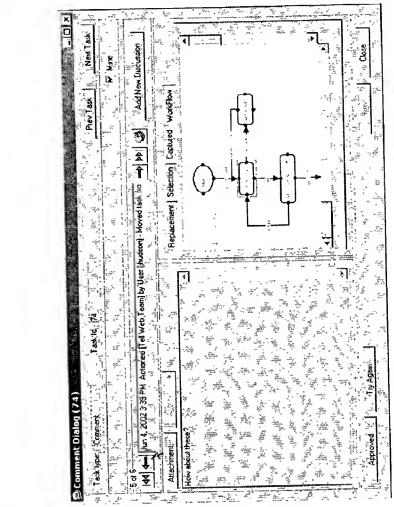

96
Comment Dialog (74)
Task View: Comment
Task No. 74
Prior Task
Next Task
More
Add New Discussion
Jun 4, 2003 3:33 PM: Assigned (Review) from Jo Viewr [Student] Moved task to
Attachment
How about these?
Replacement
Selection
Current
Work Flow
Approved
Try Again
Close

FIG. 11C

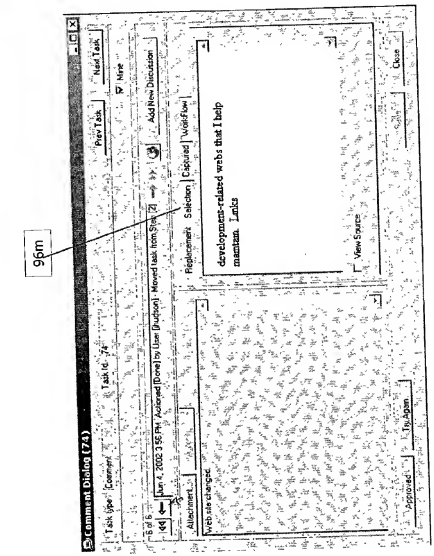
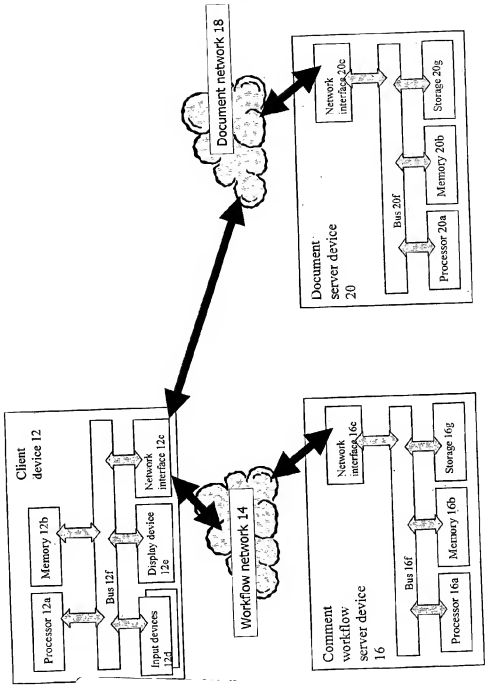

96
96m
Comment Dialog (74)
Task Type
Comment
Task Id:
74
Prev Task
Next Task
Jan 4, 2002 3:56 PM Actioned [Done] by User [Fulton] - Moved task from Step 70
Add New Discussion
Attachment
Replacement
Selection
Captured
Workflow
Attachment
developments-related words that I help
maintain Lanka
View Source
Approved
Up Again
Close

FIG. 12


Client device 12
Processor 12a
Memory 12b
Bus 12f
Input devices 12d
Display device 12e
Network interface 12c
Workflow network 14
Document network 18
Comment workflow server device 16
Network interface 16c
Bus 16f
Processor 16a
Memory 16b
Storage 16g
Document server device 20
Network interface 20c
Bus 20f
Processor 20a
Memory 20b
Storage 20g

MARKUP WORKFLOW MANAGEMENT SYSTEM

TECHNICAL FIELD

[0001] This invention relates to workflow management systems.

BACKGROUND

[0002] New demands are pushing firms and vendors toward an integrated approach to managing documents, digital assets, and Web content. With respect to Web content, products have been developed to manage and publish the Web content for their intranet, extranet, and Internet sites. In addition to such management features as library services and administration, these products allow for content-authoring, template-design, and Web publishing workflows. In certain applications, these products also interface with application servers for personalization, scalability, and delivery.

SUMMARY

[0003] In a general aspect of the invention, a computer-implemented method includes rendering a web page in a browser control in a user interface; detecting user input that selects a portion of the web page; presenting a dialog in the user interface that detects user input of a markup to the portion of the web page; and specifying a collection of users to notify of the markup.

[0004] Embodiments of this aspect of the invention may include one or more of the following features. The method also includes generating a task entry that specifies the selected portion of the web page, the markup, and the collection of users to notify. The task entry can also specify one or more of the following: 1) a copy of the web page, 2) the user that provided the user input, and 3) the approximate time that the user input was detected.

[0005] The method also includes saving the task entry to a database of task entries. The dialog includes a collection of HTML (Hypertext Markup Language) editing controls that detect user input of the markup. In certain embodiments, the dialog detects user input requesting a rendering of the web page that incorporates the markup. In other embodiments, the dialog renders a plurality of controls corresponding to a plurality of collections of users and wherein the dialog detects user input identifying the collection of users to notify from among the plurality of collections. For example, the plurality of controls can include buttons, while the plurality of controls includes entries in a list.

[0006] In another aspect of the invention, a computer-implemented method for markup workflow management includes the following. A web page is loaded over a first logical network connection to a web server. Markup content for the web page is loaded over a second logical network connection to a workflow server different from the web server, where the markup content specifies changes to a target portion of the web page and has a resolution status relative to a workflow model. If the resolution status indicates the markup content is unresolved, the web page is rendered with an icon superimposed on the web page proximate to the target portion. If the resolution status indicates the markup content is resolved, the web page is rendered with no alteration that indicates the markup content.

[0007] Embodiments of this aspect of the invention may include one or more of the following features. The web page is rendered with the icon superimposed includes detecting user interaction with the icon. The method also includes responding to detected user interaction with the icon by rendering a dialog containing the markup content.

[0008] In still another aspect of the invention, a computer-implemented method for markup workflow management includes maintaining a database of unresolved tasks in a workflow project, each such task having a reference to a web page, a markup to a target portion of the web page, and an indication of a party responsible for working on the task next; and rendering a task from the database of unresolved tasks in a dialog that includes a display control, such that when a user activates the display control, the web page is rendered.

[0009] Embodiments of this aspect of the invention may include one or more of the following features. The display control includes a list of unresolved tasks which, for example, indicate that the user is the party responsible for working on the tasks next. Each such task also can have a copy of the web page or can have a resolution status that indicates whether work on the task is complete.

[0010] In yet another aspect of the invention, an article includes a machine-readable storage medium that stores executable instructions to perform markup workflow management. The instructions cause a machine to maintain a database of tasks in a workflow project, each such task having an address of a web page, a copy of the web page, a markup to a target portion of the web page, a resolution status within the workflow project, and an indication of a next party responsible for resolving the task.

[0011] The method and article allow for the following advantages.

[0012] The method uses a computer to collect information about a markup to a web page, and to collect information specifying a collection of users to notify of the markup. The method integrates both markup collection and workflow features, such that the same process that collects markup information also automatically generates a task that has a status governed by a workflow model.

[0013] The method also guides the progress of a markup-related task according to the workflow model. For a given task, the automated system presents users with a collection of notification options that is tailored to the task's current progress within the workflow model.

[0014] The method stores the information about the markup independently of the storage of the web page. For example, the web page could be provided by a vendor's proprietary document management system, or in an information security environment that does not permit modifications to the web page. Even with no control over the storage of the web page itself, the invention collects markup information about the web page and provides for management of work that moves the markup toward resolution. Furthermore, the method provides for markup workflow management from a workflow server which stores workflow and task data and which is independent of the server that provides web pages. Indeed, the workflow server need not directly communicate with the server that provides web pages at all. For instance, the server that provides web pages

could be in a network whose security procedures block communication with the workflow server; the method would still perform as described, as it merely requires a client to communicate with the server that provides web pages.

[0015] The method includes rendering web page to include icons that visually indicate whether portions of the web page are referenced by unresolved tasks. Each such icon corresponds to an unresolved task and is superimposed over the web page near the portion that the task references.

[0016] The method allows users to avoid redundant markup. For example, the first person to mark up a typographical error rapidly communicates that change to all other reviewers of that page. The method combines a user interface and processes for document review with a user interface and processes for communication between users about markups and related workflow.

[0017] The method captures entire discussions relevant to a single proposed revision, i.e., a task, including counter-proposals that suggest different revisions, without the need to place additional, competing task icons in the document. For one thing, this simplifies the user interface. Users who disagree with the proposed change can start a discussion at the task associated with the icon.

[0018] The details of one or more embodiments of the invention are set forth in the accompanying drawings and the description below. Other features, objects, and advantages of the invention will be apparent from the description and drawings, and from the claims.

DESCRIPTION OF DRAWINGS

[0019] **FIG. 1** is a diagram of a comment workflow management system.

[0020] **FIG. 2** is a block diagram of logical modules in a client, a document server, and a comment workflow server.

[0021] **FIG. 3** is a block diagram of a conceptual architecture for a workflow management system.

[0022] FIGS. **4A-4B** are block diagrams of database tables used by a comment workflow server.

[0023] **FIG. 5** is a flowchart of a workflow model and a block diagram of related entities.

[0024] **FIG. 6** is a time sequence diagram of a page display process.

[0025] **FIG. 7** is a time sequence diagram of a comment posting process and a task list display process.

[0026] FIGS. **8A-8B** are time sequence diagrams of a task editing process.

[0027] **FIG. 9** is a diagram of a comment display process.

[0028] FIGS. **10A-10D** illustrate example user interface windows and dialogs at different steps in a workflow.

[0029] **FIG. 10E** illustrates an example rendering of a web page incorporating proposed changes.

[0030] **FIGS. 11A and 11B** illustrate an example comment editing dialog rendering history points and workflow information.

[0031] **FIG. 12** is a block diagram of a client device, a comment workflow server device, and a document server device.

DETAILED DESCRIPTION

[0032] Referring to **FIG. 1**, broadly, and as will be explained in more detail below, a comment workflow management system **10** enables human users **22** to organize work that involves multiple tasks. Comment workflow management system **10** is automated and runs on computers. The physical components of comment workflow management system **10** include a client device **12** that allows a user **22** to communicate with a comment workflow server device **16** across a workflow network **14**. Client device **12** also communicates with a web server device **20** across document network **18**.

[0033] Comment workflow management system **10** manages information about the work, for example by representing a project that has collections of tasks. Comment workflow management system **10** also manages information about users **22**, for example by tracking users **22** and organizing them according to roles that can represent shared centers of responsibility. Each task when it is created is unresolved. Users **22** move tasks toward resolution. With comment workflow management system **10**, a first user **22** can create a task and direct it to the attention of a role. A second user **22** can browse a list of tasks that have been directed to the second user's attention via roles. The second user **22** can select a task from the list, work on the task, and either indicate that the task is complete (i.e., mark the task resolved) or direct the task to the attention of another role. A given task is repeatedly selected, worked on, and delegated until it is resolved. The metaphorical flow of "workflow" is the succession of delegations, from creation toward resolution.

[0034] Comment workflow management system **10** provides each project with a workflow model, which specifies permissible steps for tasks to follow in the project. Each task follows a path from a creation step to a resolution step. Routings define transitions between steps. A workflow model includes a creation step, a resolution step, optional intermediary steps, and routings that allow tasks to follow paths toward resolution.

[0035] In particular, comment workflow management system **10** organizes work related to document revisions, for example web pages. Each revision involves a portion of document, such as the wording of a sentence, the placement of a paragraph, a choice of typeface, and so forth. Thus, the revision can be to the content, for example text, images, or animation, as well as to the format or arrangement of the content. A markup occurs when a user attaches information to the document that describes a revision. On printed matter, markups can be placed on slips of paper attached to the original document, or can be made with a pencil directly on the document, for instance. For virtual documents, for example digital representations of documents, a markup involves capturing information that describes the revision.

[0036] Comment workflow management system **10** presents web pages to users **22** via a user interface. With comment workflow management system **10**, a user **22** can view a web page and select a portion to comment on. Comment workflow management system **10** receives the

user's comments and proposed revisions, collecting this information into a task. The task includes information such as the web page location, the portion selected for the comments, and a copy of the web page itself. Comment workflow management system **10** also captures the user's delegation of the task to a role, adding the task to a collection of tasks for the delegated role.

[0037] Subsequently, comment workflow management system **10** presents a responding user **22** with a list of unresolved tasks delegated to that user. To work on a task, responding user **22** can retrieve information such as the comments of the delegating user **22**, the relevant web page, the portion specified by the task, and the proposed revision. When routings permit, responding user **22** can move the task between steps of the project. Moreover, in the dialog that displays the task, comment workflow management system **10** presents the user **22** with options that correspond to the routings defined within the workflow model for the task **62** in its current step.

[0038] The responding user **22** can also contribute additional information about the task. Comment workflow management system **10** presents tasks in a dialog that allows subsequent comments and revisions. Each comment is recorded along with information about the user, the time the comment was added, and the status of the task (for example, its current step within the workflow model). Over time, comment workflow management system **10** collects all such comments on a task, recording a history of the discussion and work on a given task.

[0039] When a task is resolved, comment workflow management system **10** removes it from lists of delegated tasks. When a task is not yet resolved comment workflow management system **10** includes a special browsing interface for examining the web page: comment workflow management system **10** renders the web page with an icon overlaid near the portion of the page referenced by the task.

[0040] Furthermore, when a first user is reviewing a page that a second user marks up, i.e., creates a task for, comment workflow management system **10** notifies the first user of the change. Markups are communicated between users quickly and automatically.

[0041] A user can browse the workflow history and the discussion history of a task. Comment workflow management system **10** stores "history points" which indicate transitions between steps, contributions to a discussion, and proposed alternative revisions. A user can browse the history points of a task, viewing each one together with contextual information such as the then-current step within the workflow model, or a rendering of the web page with a suggested revision performed. Comment workflow management system **10** also allows a user to preview a proposed revision before committing the task to the system.

[0042] Comment Workflow Management System

[0043] Referring now to **FIG. 2**, at a software level, comment workflow management system **10** includes client application **24**, comment workflow application **26**, and document server application **28**, which are processes encoded as software instructions. Client device **12** runs a client application **24**, comment workflow server device **16** runs a comment workflow application **26**, and document server device **20** runs a document server application **28**.

[0044] Client application **24** includes user interface logic **30**, XML encode/decode logic **34**, and network layer logic **36**. User interface logic **30** manages the display of a user interface on client device **12** to user **22** (**FIG. 1**). XML encode/decode logic **34** and network layer logic **36** manage communication with comment workflow application **26**. XML encode/decode logic **34** translates data in and out of XML, while network layer logic **36** manages communication via HTTP or HTTPS at the network layer. User interface logic **30** includes an embedded IE (Microsoft Internet Explorer) component **38** that renders web pages graphically on client device **12**.

[0045] Document server application **28** includes a WWW (world-wide web) server **40** that serves web pages **42**.

[0046] Comment workflow application **26** includes a web application **44**, an ORB (object request broker) **48**, and a database **52**. Web application **44** includes CGI (Common Gateway Interface) scripts **46**. ORB **48** has a collection of objects **50**. ORB **48** complies with CORBA (Common Object Request Broker Architecture) standards. CORBA is a widely used standardization scheme for object interfaces.

[0047] Conceptual Model

[0048] Referring now to **FIG. 3**, comment workflow management system **10** can track multiple projects **56**, organizing them according to domains **54**. A domain **54** is an organizational convenience for users **22** that allows them to group projects **56** as needed. For example, a freelance web production company might use comment workflow management system **10** to group projects **56** into domains **54** such that each domain **54** represents a customer and each project **56** represents a different development contract for the customer. A different collection of users **22**, for example a university, could define domains **56** that correspond to academic departments.

[0049] In the conceptual model of comment workflow management system **10**, domain **54** is the broadest category. Each domain **54** includes one or more projects **56** and one or more user profiles **66**. In turn, each project **56** includes a workflow model **58**, a collection of content references **60**, and a collection of tasks **62**. A profile **66** represents a specific user **22**.

[0050] Comment workflow management system **10** defines a workflow model **58** as a set of steps and associated routing information. Every task **62** must be processed as defined in the workflow **58**, proceeding from step to step. When a task **62** arrives at a given step, comment workflow management system **10** considers the task **62** to have been delegated to each of a set of users **22**, as identified by the corresponding user profiles **66**.

[0051] A user **22** can span domains **54**. In other words, a user **22** can be identified by a first profile **66** in one domain **54** and by a second profile **66** in a different domain **54**.

[0052] Content references **60** specify sources for documents such as web pages **42**. One example of a content reference **60** specifying a source is by citing a URL (Uniform Resource Locator). Content references **60** can also specify hierarchical structure within the sources, for example directory structures in a filing system, or virtual directories within a URL.

[0053] Database

[0054] Referring now to **FIGS. 4A and 4B**, database **52** is a source of data that is accessible via ODBC (Open Data-Base Connectivity, which is an interface standard for databases). Database **52** includes tables for domain **54**, project **56**, workflow model **58**, task **62**, user profile **66**, role **68**, history point **72**, and icon record **78**.

[0055] In database **52**, some attributes of a conceptual entity may be connected indirectly to the record that most closely corresponds to the conceptual entity. For example, from one perspective, a discussion of a task is an attribute of the task, but in this embodiment, database **52** does not store discussions directly in task records **62**. Instead, database **52** represents such discussions as collections of individual contributions by user profiles, where each contribution is stored in a history point, and each history point is connected to a task via a task reference, as will be explained. In general, for simplicity, this discussion uses terms such as domain **54**, project **56**, workflow model **58**, task **62**, user profile **66**, role **68**, history point **72**, and icon record **78**, to refer interchangeably to the corresponding table in database **52** or to the conceptual entity that the table represents.

[0056] Project

[0057] Project **56** includes fields for project ID **56***a*, project name **56***b*, and domain FK (foreign key) **56***c*. Project ID **56***a* uniquely identifies records of project **56** relative to one another. Project name **56***b* stores a caption for project **56** to present to a user **22**. Domain FK **56***c* associates project **56** with domain **54** by referencing domain ID **54***a*.

[0058] Each project **56** also has a collection of content references **60** (shown in **FIG. 3**) and a collection of tasks **62**.

[0059] Domain

[0060] Domain **54** includes fields for domain ID **54***a* and domain name **54***b*. Domain ID **54***a* uniquely identifies records of domain **54** relative to one another. Domain name **54***b* stores a caption for domain **54** to present to a user **22**.

[0061] Workflow Model

[0062] Broadly, workflow model **58** represents a state machine that governs the progress of tasks **62** from creation to resolution.

[0063] Workflow model **58** includes fields for workflow ID **58***a* and project FK **58***c*. Workflow ID **58***a* uniquely identifies records of workflow model **58** relative to one another. Project FK **58***c* specifies the project **56** associated with each workflow model **58**. Specifically, project FK **58***c* references project ID **56***a*.

[0064] Each workflow model **58** has at least a creation step associated with it; it can also have a terminal step, one or more intermediary steps, and a collection of routings.

[0065] A single routing **76** can both depart creation step **74** and arrive at terminus step **74**. More commonly, though, the endeavor modeled by workflow model **58** is more complex. For example, web-page markup work often has intermediary stages devoted to review and approval. Thus, workflow model **58** often represents a more complicated series of transitions, including one or more intermediary steps **74**.

[0066] A workflow model has either zero or one terminus step **74**. A workflow model cannot have more than one terminus step **74**.

[0067] Step

[0068] A step **74** describes a permissible state of a task **62** within a workflow model **58**.

[0069] Each step **74** includes fields for step ID **74***a*, role FK **74***b*, workflow FK **74***c*, step type **74***d*, and step number **74***e*. Step ID **74***a* uniquely identifies records of step **74** relative to one another. Role FK **74***b* specifies a role **68** for step **74** by referencing role ID **68***a*. Every intermediary-stage step **74** is associated with some role **68**. A terminus step has no associated role, and the role associated with the creation step is predefined. Workflow FK **74***c* specifies a workflow model **58** for step **74** by referencing workflow ID **58***a*.

[0070] Step type **74***d* indicates whether a given step is a creation step, a terminus step, or an intermediary. A creation step **74** represents a starting point for a task **62**. A terminus step **74** represents a resolution for a task **62**. Each valid workflow model **58** has at least one creation step **74** and zero or one terminus step **74**.

[0071] Step number **74***e* indicates the ordinal position of step **74** within workflow model **58**. Within a given workflow model **58**, each step **74** has a distinct value for step number **74***e*.

[0072] To label a given step **74** for a user **22**, comment workflow management system **10** uses the caption for the associated role **68**.

[0073] Routing

[0074] A routing **76** represents a directed transition that a task **62** is permitted to make from a source step **74** to a target step **74**.

[0075] Each routing **76** includes fields for a routing ID **76***a*, a source step FK **76***b*, a target step FK **76***c*, and a routing name **76***d*. Routing ID **76***a* uniquely identifies records of routing **76** relative to one another. Source step FK **76***b* specifies source step **74** by referencing step ID **74***a*, while target step FK **76***c* specifies target step **74** by referencing step ID **74***a*. Routing name **76***d* stores a caption for routing **76**, for instance to present to a user **22** in the user interface.

[0076] For a given step **74**, the routings **76** that depart from it must have distinct names, i.e., distinct values for routing name **76***d*. This distinctiveness allows comment workflow management system **10** to present user **22** with recognizably different names for controls, when user **22** is choosing among possible routings for a task departing the given step.

[0077] Role

[0078] A role **68** represents a collection of one or more users **22** that have a responsibility in common. For example, one role **68** could represent a group responsible for graphic design, while another role **68** represents a group responsible for writing copy. A given role **68** can be associated with more than one user profile **66**; likewise, a given user profile **66** can be associated with more than one role **68**.

[0079] Role **68** includes fields for role ID **68***a* and role name **68***b*. Role ID **68***a* uniquely identifies records of role **68** relative to one another. Role name **68***b* stores a caption for role **68** to present to user **22**. Each Role **68** has a collection

5/11/08, EAST Version: 2.2.1.0

of user profiles **66**, which identify the users **22** to which a task can be delegated when it is in a particular step **74** of a workflow model **58**.

[0080] Each project **56** includes a special, predefined role for user profiles **66** who can create tasks. This role is associated with the creation step of the workflow model.

[0081] User Profile

[0082] Comment workflow management system **10** represents a user **22** internally via a user profile **66**. Conceptually, a user profile **66** is like a user account. A given user **22** has a user name (stored in user name **66***b*) and login password (stored in password **66***c*).

[0083] User profile **66** also includes user ID **66***a*, which uniquely identifies records of user profile **66** relative to one another.

[0084] Each user profile **66** has a collection of role memberships **66***e*. A role membership **66***e* joins a user profile **66** to a role **68**. A given user profile **66** has one role membership **66***e* for each role **68** that the user profile **66** belongs to. Each role membership **66***e* includes a role FK **66***f*, which references role ID **68***a*, and a profile FK **66***g*, which references user ID **66***a*.

[0085] Each user profile **66** also has a collection of project memberships **66***h*. A project membership **66***h* joins a user profile **66** to a project **56**. A given user profile **66** has one project memberships **66***h* for each project **56** that the user profile **66** belongs to. Each project membership **66***h* includes a project FK **66***i*, which references project ID **56***a*, and a profile FK **66***k*, which references user ID **66***a*.

[0086] Task

[0087] A task represents an amount of work to be done within a project **56**. For example, a task **62** can represent a comment that a user **22** makes regarding a web page **42**, including the commentary, the current user profile **66**, a timestamp, the proposed change, and a copy of the web page **42** as it existed when the comment was made. Task **62** includes state information describing the progress of task **62** toward resolution within workflow model **58**, for example the step number **74***e* of the step **74** that task **62** is currently affiliated with.

[0088] Each task **62** includes fields for task ID **62***a*, project FK **62***c*, current user FK **62***e*, current step number **62***f*, creation date **62***g*, selected text **62***h*, and URL **62***j*. Task ID **62***a* uniquely identifies records of task **62** relative to one another. Project FK **62***c* specifies a project **56** for task **62**, referencing project ID **56***a*.

[0089] State information of task **62** can include a single user profile **66** affiliated with task **62**, specified by current user FK **62***e* referencing user ID **66***a*. For example, it is possible for several user profiles **66** to share a role **68** to which a given task **62** is delegated. Current user FK **62***e* can identify a single user profile **66** that has claimed responsibility for task **62**.

[0090] Current step number **62***f* affiliates task **62** with a current step **74** by referencing step number **74***e*. Creation date **62***g* indicates when task **62** was created.

[0091] Selected text **62***h* stores a copy of the portion of the web page with which task **62** is associated. URL **62***j* stores an address for the web page.

[0092] History Point

[0093] A task has a collection of history points **72**. Broadly, history points **72** store information that describes the task's evolution over time, for example as work is performed that moves it toward resolution. In particular, a history point **72** can describe a transition between steps of a workflow model. Also, history points **72** capture contributions to a discussion among users. Each history point can store a contribution. Furthermore, history points **72** can store counterproposals that responding users may provide, recommending different revisions than the revision originally proposed for the associated task.

[0094] Each history point **72** includes fields for point ID **72***a*, task FK **72***b*, from-step FK **62***c*, to-step FK **62***d*, point type **62***e*, point date **62***f*, point user FK **72***g*, discussion contribution **72***h*, replacement **72***j*, and snapshot **72***k*. Point ID **72***a* uniquely identifies records of history point **72** relative to one another. Task FK **72***b* associates history point **72** with a task record by referencing task ID **62***a*. From-step FK **62***c* and To-step FK **62***d* indicate steps **74** that associated task **62** transitions between, each referencing step ID **74***a*. Point date **62***f* indicates a time of creation for history point **72**. Point user FK **72***g* indicates the user profile **66** that performed the activity represented by history point **72**. Discussion contribution **72***h* stores text of a user's contribution to a discussion of the associated task **62**. Replacement **72***j* stores an HTML characterization of a proposed replacement for the portion of the web page referenced by associated task **62**. Snapshot **72***k* stores a copy of the reference web page as it existed at the time history point **72** is generated.

[0095] Icon

[0096] Each icon record **78** identifies the portion in the web page to which the task **62** applies. Each icon record **78** includes fields for icon ID **78***a*, which uniquely identifies the icon, task FK **78***b*, which identifies the task with which this icon is associated, and selected area **78***c*, which is a copy of the portion of the web page with which this task is associated.

[0097] Tasklist

[0098] A tasklist **82** is a dynamic collection of unresolved tasks **62** associated with a user profile **66**. A task **62** is added to a profile's tasklist **82** when the task is delegated to the user profile **66**, whether directly or via a role **68**. A task **62** is removed from all tasklists **82** that contain it when the task **62** becomes resolved. Also, a task **62** is removed from the tasklist **82** of a given profile **66** when it is delegated elsewhere, for example delegated to a role **68** that does not contain the given profile **66**, or delegated to a specific, other user profile **66** by being claimed via the current user FK **62***e* reference.

[0099] **FIG. 10B** shows an example rendering of a tasklist **82** in a user interface.

[0100] Workflow Model Example

[0101] Referring now to **FIG. 5**, this description follows an example workflow model **58**, illustrated here as a graph, that includes four steps **74**. One of the steps is a creation, one is a terminus, and two are intermediary. Tasks **62** for this workflow model **58** originate at creation step **74**, labeled "CREATOR". Tasks **62** progress through steps **74** labeled "WEBTEAM" and "WEBOWNER". In this example, the

terminus step **74** has no text label. Since labels on steps **74** are stored in the role name **68***a* (shown in **FIG. 4A**) of the role **68** that corresponds to each step **74**, a terminus step **74** need not have a corresponding role **68**; for one thing, tasks **62** at a terminus step **74** are resolved and thus need no further delegation.

[0102] Workflow model **58** also includes routings **76** that define permissible paths of progress between steps **74**. The labels "Tell WebTeam", "Done", "Rejected", and "Approved" are stored in routing names **76***d* on the corresponding routings **76**.

[0103] In operation of workflow model **58**, client application **24** creates a task **62**, initially associated with creation step **74**. Client application **24** provides a dialog in a user interface for a creating user **22** to populate the task **62** and to choose a routing **76** for it. The creating user **22** selects a control on the dialog corresponding to routing **76** labeled "Tell WebTeam". If any required information is missing, client application **24** sets the required information to default values. Then, comment workflow management system **10** transfers the task **62** to the step **74** labeled "WEBTEAM".

[0104] At this point, the task **62** appears on the tasklists **82** of any user profile **66** that belongs to the role **68** associated with the step **74** labeled "WEBTEAM". The role FK **74***b* (**FIG. 4A**) on step **74** specifies the association of step **74** with role **68**. A user profile **66** belongs to a role **68** if a role membership **66***e* is present that specifies both the user profile **66** and the role **68**.

[0105] Next, a user **22** with a qualifying user profile **66**, for example the user **22** labeled "Larry", edits the task **62** using an editing dialog. The dialog includes a control, for example a button, corresponding to the routing **76** labeled "Done". Larry clicks the button to indicate that he has resolved the task **62**. Comment workflow management system **10** removes the resolved task **62** from the tasklists **82** of the "WEBTEAM" and transfers the task **62** along the routing **76** labeled "Done". The task **62** arrives at the step **74** labeled "WEBOWNER".

[0106] At this point, task **62** appears on the tasklists **82** of all user profiles **66** belonging to the role **68** associated with the step **74** labeled "WEBOWNER". For example, user **22** labeled "Sue" is associated with this step **74**. Sue can edit the task **62** from her tasklist **82**. Client application **24** presents a dialog that includes controls corresponding to each of the routings **76** available to task **62** at this point: namely, the routing **76** labeled "Rejected" and the routing **76** labeled "Approved". Sue can activate the control for "Approved" to indicate that she has reviewed and approved the changes made by Larry during the step **74** labeled "WEBOWNER". In this case, comment workflow management system would transfer task **62** along the routing **76** labeled "Approved". Task **62** would arrive at terminus step **74**. Alternatively, Sue can activate the control for "Rejected" to indicate that more work is needed. In this case, comment workflow management system **10** would transfer the task **62** along the routing **76** labeled "Rejected" back to the step **74** labeled "WEBTEAM". In either case, the task **62** would disappear from the tasklists **82** of "WEBOWNER" user profiles **66**.

[0107] When the task **62** reaches terminus step **74**, comment workflow management system **10** considers the task **62** resolved.

[0108] Client Application

[0109] Client application **24** includes processes that allow a user **22** to participate in workflow within comment workflow management system **10**. Client application **24** uses a login process, a page display process **84**, a comment posting process **86**, a task list display process **88**, a task editing process **90**, and a comment display process **92**.

[0110] User **22** interacts with client application **24** in a session. The login process initiates a session as user **22** chooses a user profile **66**, for instance by providing a username and password that match user name **66***b* and password **66***c*, respectively (shown in **FIG. 4A**). Login process also associates the current session with a current project **56** in a current domain **54**.

[0111] Page Display Process

[0112] Referring now to **FIG. 6**, page display process **84** operates after a user **22** has logged in to a client application **24**. UI logic **30** presents a user interface to user **22** and mediates between page display process **84** and actions by user **22**.

[0113] Page display process **84** detects a request by user **22** to view a web page **42**, for instance by detecting a click on a hyperlink in a web browser, where the hyperlink specifies the URL of web page **42** served by WWW server **40** (step **84***a*). Page display process **84** sends an HTTP request to WWW server **40** for web page **42** (step **84***b*), for instance using document network **18**. Page display process **84** retrieves tasks **62** associated with web page **42** from comment workflow application **26** (step **84***c*), using workflow network **14**. In particular, page display process **84** sends an HTTP request to a CGI script **46**. Within comment workflow application **26**, CGI script **46** sends a CORBA message to a corresponding object **50**, which queries database **52** and returns the requested tasks **62**. Only tasks **62** that are unresolved are selected by the query. A task is associated with a web page when the URL **62***j* of a task **62** specifies the web page.

[0114] Page display process **84** renders web page **42** overlaid with icon images **98** representing icon records **78** (step **84***d*). Each such icon image **98** is a graphical representation of a task **62** that pertains to web page **42**. Moreover, icon image **98** is positioned on web page near the portion of web page **42** referenced by the corresponding task **62**. A task **62** references a portion of a web page **42** in selected area **78***c* of an icon record **78** associated with the task.

[0115] Web page **42** may be dynamic. In particular, web page **42** may have changed in the interim since a task **62** referenced a portion of the web page. If the referenced portion of web page **42** has changed or is missing, page display process **84** renders the corresponding icon record **78** as an "orphan" in a default location, for instance in the upper-left corner of web page **42**. Page display process **84** can also change the visual style of icon image **98**, for instance its color, to indicate orphan status.

[0116] If comment workflow management system **10** does not have any tasks **62** corresponding to web page **42**, page display process **84** renders web page **42** without any overlay.

[0117] Page display process **84** automatically refreshes its collection of unresolved tasks **62** associated with web page

42 and re-renders the page (i.e., repeats steps 84c and 84d) on an ongoing basis. Page display process 84 maintains a timer that indicates the amount of time elapsed since tasks 62 of web page 42 were last retrieved from comment workflow application 26. If user 22 selects a new web page 42 or refreshes it, page display process 84 resets the timer. If the timer reaches a predetermined limit, for example 60 seconds, indicating that no tasks have been retrieved in that time, page display process 84 contacts comment workflow application 26 to refresh its collection of tasks 62 is up-to-date. If, for example, another user has added an unresolved task 62 to web page 42 in the interval since page display process 84 last retrieved tasks 62, page display process 84 incorporates the new task into its collection. Similarly, if a task in the collection is newly resolved, page display process 84 removes the resolved task from its collection. Thus, page display process 84 ensures that changes to tasks 62 at comment workflow application 26 propagate quickly to client application 24. For example, for a timer with a 60-second limit, page display process 84 ensures that the average delay for a changed task to propagate is approximately 30 seconds, or even less if user 22 causes more frequent retrievals.

[0118] One result of rapid propagation of task changes to client application 24 is that user 22 receives highly current information about which portions of web page 22 have already been marked up by other users. This reduces the likelihood that user 22 will propose a separate markup that is redundant to or in competition with another user's existing markup. As will be explained in more detail with regard to FIGS. 10A-10D, if, for a given portion of web page 42 having a task 62 already proposed, user 22 wishes to propose a different markup, user 22 can contribute to a discussion of the existing task 62 rather than create a new one. In this fashion, comment workflow management system 10 guides users to consolidate their competing (but related) editorial input under a single rubric. In particular, when mutually-exclusive markup proposals exist, only one which will be adopted, they each can be represented in comment workflow management system 10 by a single task 62.

[0119] Page display process 84 uses embedded browser 38 of client application 24 to render web page 42.

[0120] Comment Posting Process

[0121] Referring now to FIG. 7, comment posting process 86 operates after a user 22 has logged in to a client application 24 and loaded a web page 42, for instance using page display process 84. UI logic 30 presents a user interface to user 22 and mediates between comment posting process 86 and actions by user 22. The current user session is associated with a current project 56, which includes a workflow model 58.

[0122] Comment posting process 86 detects that user 22 selects a portion of web page 42 and requests to enter a markup (step 86a). For example, user 22 can click and drag a mouse to highlight a block of rendered text, then activate a control that requests a markup. The control is a menu option on a context menu opened by right-clicking on the highlighted portion, for instance. Comment posting process 86 captures the HTML source for the block of rendered text.

[0123] Instead of highlighting text, user 22 can select a hyperlink or image. Thus, comment posting process 86 captures the HTML source for the selected portion, whether it is text, hyperlink, or image.

[0124] Comment posting process 86 presents user 22 with a dialog to receive input describing a comment to be stored as a task 62. The dialog includes controls (for example, buttons) corresponding to routings 76 that describe transitions out of the creation step 74 for workflow model 58. An example dialog is described in more detail with regard to FIGS. 10A-10E and FIGS. 11A-11B.

[0125] User 22 can enter a reason for the comment into a text box associated with discussion contribution 72b. User 22 can provide sample modifications to web page, using an HTML editor. The sample modifications are received in a control associated with replacement 72f. User 22 can preview what the modifications will look like by activating a button, which causes UI logic to render the web page with the modification incorporated. The web page is rendered in a window with tabs for both the original web page and the proposed modifications, allowing user 22 to compare the two versions and to verify that the proposed modifications are acceptable.

[0126] Comment posting process 86 waits for user 22 to dismiss the dialog. User 22 can cancel the dialog for the task, for example if the previewed modification is not acceptable to the user. If the current task is a new task and the user cancels the dialog, comment posting process 86 terminates without creating the task 62 or related records in database 52. If the current task is not a new task and the user cancels the dialog, comment posting process 86 terminates without modifying the task 62 or related records in database 52.

[0127] If user 22 dismisses but does not cancel the dialog, comment posting process 86 validates and supplements the information to ensure that the information describes a valid task 62 (step 86c). For example, if more than one routing 76 is available for the new task 62, user 22 must choose a routing 76 using the associated controls. If user 22 does not choose a routing 76, comment posting process 86 does not transition the task, even if there is only one available routing 76. This allows user 22 to update a task incrementally without incurring a transition. When user 22 does select a transition, comment posting process 86 supplements the user input as needed according to default values, forming a complete set of information necessary for the task 62 to transition.

[0128] Comment posting process 86 generates a task 62 for the information (step 86d). Project FIG. 62c receives a reference to the current project 56, URL 62j indicates the URL of web page 42, and selected text 62h and selected area 78c indicate the text and location, respectively, of the portion of web page 42 selected for the task. Comment posting process 86 generates a history point 72 describing the creation of the task 62, specifying the current user profile 66 in point user FK 72g and the current time in point date 72f, and storing a copy of web page 42 in snapshot 72k. Replacement 72j stores the proposed revision, if any. To-step FK 72d receives the target step 74 associated with the chosen routing 76.

[0129] Comment posting process 86 associates the history point 72 with the task 62. Similarly, comment posting process 86 creates icon record 78 and associates it with the task, as well.

[0130] Comment posting process **86** transmits the new task **62** and associated history point **72** to comment workflow application **26** for storage in database **52** (step **86***e*). Comment posting process **86** confirms the success of the posting transaction before completing.

[0131] If the new task is unresolved, i.e., not at a terminus step **74**, the task appears in the tasklist **82** for each user profile **66** associated with the task's current step.

[0132] Task List Display Process

[0133] Task list display process **88** operates after a user **22** has logged in to a client application **24**. UI logic **30** presents a user interface to user **22** and mediates between task list display process **88** and actions by user **22**. The current user session is associated with a current project **56**, which includes a collection of tasks **62**.

[0134] Task list display process **88** retrieves a tasklist **82** for the current user profile **66** from comment workflow application **26** (step **88***a*). Tasklist **82** includes tasks **62** affiliated with steps **74** that, in turn, are either directly affiliated with the current user profile **66** or are affiliated with a role **68** that includes the current user profile **66**. Moreover, the tasks **62** are associated with the current project **56** and are unresolved, i.e., not at a terminus step **74** in the current workflow model **48**.

[0135] Task list display process **88** renders tasklist **82** in a panel of a window presented by UI logic **30** (step **88***b*). An example panel is shown in FIGS. **10A-10D**. The panel includes a title bar along the upper edge, scroll bars along the lower and right edges, and a table of rows and columns. The columns correspond to fields of tasks **62**, while the rows correspond to individual tasks **62**. The top row of each column includes column header labels that describe the fields.

[0136] Task Editing Process

[0137] Referring now to **FIG. 8A**, task editing process **90** operates after a user **22** has logged in to a client application **24** and viewed a current tasklist **82**, for instance by using task list display process **88**. UI logic **30** presents a user interface to user **22** and mediates between task editing process **90** and actions by user **22**. The current user session is associated with a current project **56**, which includes a collection of tasks **62**.

[0138] Task editing process **90** detects the selection of an entry in tasklist **82**, for example a double-click by the user **22** on the corresponding row in the control displaying tasklist **82** (step **90***a*). Task editing process **90** retrieves task **62** corresponding to the selected entry in tasklist **82** from comment workflow application **26** (step **90***b*). Task **62** has URL **62***i*, which specifies a URL for a web page **42** served by WWW server **40**. Task editing process **90** retrieves web page **42** (step **90***c*). Task editing process **90** renders web page **42** and opens a dialog for editing task **62** (step **90***d*). Task editing process **90** renders web page **42** using embedded browser **38** of client application **24**. An example dialog is shown in FIGS. **10A-10D**.

[0139] If WWW server **40** does not provide web page **42**, for instance due to network problems, or if web page **42** has changed, task editing process **90** retrieves the snapshot of web page **42** from task **62**.

[0140] User **22** can use the dialog to inspect task **62**, including: the portion of the web page **42** specified by the task **62** in selected area **78***c* of associated icon record **78**; the proposed change, stored in replacement **72***j*; and the described reason for the proposal stored in discussion contribution **72***h* of associated history point **72**. User **22** can then take action, during task editing process **90** but separate from it, to implement the proposed change to web page **42**. For example, user **22** can use a web editing client **96** to access WWW server **40** independently.

[0141] When user **22** has finished responding to task **62**, user **22** can dismiss the dialog, indicating the next routing **76** for task **62**.

[0142] Referring now to **FIG. 8B**, task editing process **90** detects the dialog dismissal (step **90***e*) and transmits the edited task **62** to comment workflow application **26** (step **90***f*)

[0143] Comment Display Process

[0144] Referring now to **FIG. 9**, comment display process **92** operates after a user **22** has logged in to a client application **24** and loaded a web page **42**, for instance using page display process **84**. Furthermore, the web page **42** is referenced by a task **62** for which an icon record **78** is rendered as an icon image **98**. UI logic **30** presents a user interface to user **22** and mediates between comment display process **92** and actions by user **22**.

[0145] Comment display process **92** detects a click on icon image **98** which represents an icon record **78** (step **92***a*). Comment display process **92** retrieves task **62** corresponding to icon **78** from comment workflow application **26** (step **92***b*). Comment display process **92** then opens a dialog to display task **62**, if needed (step **92***c*). Comment display process **92** updates the controls in the dialog to reflect the information in the current task **62**. Comment display process **92** also uses page display process **84** to render web page **42** (step **92***d*).

[0146] Comment display process **92** presents the dialog to the user and renders the page with icon images **98** corresponding to unresolved tasks (step **92***e*). The dialog and its controls have the layout described with regard to task editing process **90**. An example dialog is shown in FIGS. **10A-10D**.

[0147] User Interface

[0148] Referring now to FIGS. **10A-10E**, UI logic **30** renders a main application window **94** that includes a resizable border **94***a* around its perimeter, a title bar **94***b* along the top edge of border **94***a*, a menu bar **94***c* next to title bar **94***b*, and a status bar **94***d* along the bottom edge of border **94***a*. The interior application of window **94** includes the visible portion of embedded browser **38** as well as optionally concealable components, including toolbars **94***e*, address bar **94***f*, a project explorer panel **94***g*, and a tasklist panel **94***h*. Embedded browser **38** renders web pages.

[0149] Project explorer panel **94***g* includes scroll bars **94***i* and a tree control **94***k* that renders a hierarchy with domain **54** at the top. Domain **54** contain projects **56**, which contain content references **60** that themselves can contain recursively nested directory structures of additional tiers of content references **60**.

[0150] Tasklist panel **94***h* includes a title bar **94***m* along its upper edge, scroll bars **94***n* along its lower and right edges,

and a table **94***p* of rows **94***q* and columns **94***r*. The columns **94***r* correspond to fields of tasks **62**, while the rows **94***q* correspond to individual tasks **62**. The top row **94***q* of each column **94***r* includes column header labels **94***s* that describe the fields.

[0151] UI logic **30** also renders a comment editing dialog **96** that includes a border **96***a* around its perimeter, a title bar **96***b* along the top edge of border **96***a*, and a task navigation bar **96***c* next to title bar **96***b* that includes controls for moving among a collection of tasks **62** and for identifying the current task **62**. Next to task navigation bar **96***c*, comment editing dialog **96** includes a claiming control area **96***d* and a history bar **96***e* next to claiming control area **96***d*.

[0152] Claiming control area **96***d* allows is a specific user profile **66** to take ownership of a task **62** in a step **74** associated with more than one user profile **66**. If checked, claiming control area **96***d* assigns ownership of the task to the current user profile **66** of the current session, removing it from the tasklists **82** of the other user profiles **66**. Task **62** is associated with a specific user profile by current user FK **62***e*.

[0153] History bar **96***e* includes controls for moving among the collection of history points **72** associated with the current task **62**, for identifying the current history point **72**, and for adding a new history point **72** to the collection.

[0154] Comment editing dialog **96** also includes a discussion panel **96***f*, which includes a text area **96***h* for browsing, editing, or creating discussion contributions **72***h*.

[0155] Comment editing dialog **96** also includes a tabbed panel **96***i*, which has tabbed sections for replacement tab **96***k*, selection tab **96***m*, captured tab **96***n*, and workflow tab **96***p*. Replacement tab **96***k* includes HTML editing controls for editing current proposed replacement **72***j* associated with current task **62**. Selection tab **96***m* displays the part of the web page that was selected when the comment was originally created, as stored in selected area **78***c* of icon **78**. Captured tab **96***n* displays a collection of automatically captured attributes, such as the web page on which the comment was created. Workflow tab **96***p* renders a picture of the workflow model **58** from the current project **56**. The current step **74** for the task is highlighted. If the user displays workflow tab **76** and then uses history bar **96***e* to walk through the history of the task **62**, the highlight will move in the workflow tab **96***p*, accordingly.

[0156] Along its bottom edge, comment editing dialog **96** includes disposition panel **96***q*, which includes buttons for dismissing comment editing dialog **96**. In particular, disposition panel **96***q* includes a save button **96***r*, a close button **96***s*, and one or more routing buttons **96***t* that each correspond to a permissible routing for current task **62** in its current state at step **74**.

[0157] **FIGS. 10B and 10C** show an icon **78** rendered as icon image **98** in an overlay on the visible portion of embedded browser **38**. In this example, the task **62** shown in comment editing dialog **96** is related to the icon **78** shown in main application window **94**.

[0158] When user **22** moves the mouse pointer over icon image **98**, UI logic **30** highlights the portion of the web page that corresponds to the value of selected area **78***c*. The highlight can be change in the background color, for example to yellow or orange. A yellow highlight indicates that UI logic **30** is able to match the portion of the web page to the value of selected area **78***c*. UI logic **30** uses yellow highlights both for an unchanged web page and for a web page that has changed but not so drastically that UI logic **30** cannot find the values stored in selected area **78***c*. The orange highlight indicates that the actual web page has changed, and the original locale of the selected portion is still on the page, but that the actual content of the selected portion is gone. In that case, UI logic **30** places the orange highlight over the corresponding locale of the web page.

[0159] **FIG. 10E** shows the proposed replacement of **FIGS. 10A and 10B** rendered in main application window **94** in a preview mode. Preview button **96***u* in replacement tab **96***k* allows user **22** to request the preview mode. Main application window **94** in a preview mode includes tabs **96***v* and **96***w*. Tab **96***v* renders the web page with the proposed replacement performed, that is, with the text of the proposed replacement rendered in place of the portion of the web page specified by the current task. Tab **96***w* renders the original web page. User can use tabs **96***v* and **96***w* to compare "before-and-after" views of the web page, for instance to verify that a replacement that the user has proposed is acceptable, or to better understand the counter-proposal that another user has recommended.

[0160] **FIG. 10A** shows a main application window **94** and a comment editing dialog **96** after a user **22** selects a portion of web page **42** and instructs client application **24** to create a new task **62**. **FIG. 10B** shows main application window **94** and comment editing dialog **96** after a different user **22** selects new task **62** from the displayed tasklist **82**. **FIG. 10C** shows main application window **94** displaying web page **42** with proposed replacement **72***j* incorporated. **FIG. 10D** shows main application window **94** after new task **62** has been resolved. For example, in **FIG. 10D**, icon image **98** for icon record **78** corresponding to new task **62** is no longer rendered.

[0161] Discussion and Context

[0162] History points **72** store contributions to a discussion of a task. With comment editing dialog **96**, user **22** can view these contributions in the context of then-current properties of the task and related entities, such as the associated step within the workflow model, at the time the contribution was made. If user **22** selects a different history point **72** for a rendered task **62**, comment editing dialog **96** updates the visual representation of the corresponding step **74** to reflect the context of the new selected history point **72**. Context information includes: a proposed replacement of the web page portion associated with the task; the corresponding step within the workflow model; the portion of the web page that the task is associated with; and data about the web page and the computing environment of client device **12**.

[0163] Replacement tab **96***k* is described with regard to FIGS. **10A-10D**.

[0164] User **22** can use comment editing dialog **96** to view a history point **72** together with a visual representation of the portion of a web page associated with task **62**. The associated portion can be rendered as interpreted HTML text or as raw **HTML** source code. Furthermore, **22** can use comment editing dialog **96** to view a history point **72** together with additional data about the context in which the task was

created, such as the address of the relevant web page, or the web browser version and the resolution of the client device **12** from which the task was first submitted.

[0165] **FIG. 11A** shows comment editing dialog **96** rendering an example task **62** that has six history points **72**, with the most recent history point **72** displayed. A caption on history bar **96***e* reads "6 of 6", indicating that the current history point **72** is the sixth for this task, out of a collection of six. Forward-moving navigation buttons are grayed out to indicate that the current history point **72** is the last of the collection for this task. Text area **96***h* presents discussion contribution **72***h* for viewing and editing. In **FIG. 11**, tabbed panel **96***i* has workflow tab **96***p* active. Workflow tab **96***p* renders a visual representation of workflow model **58** for the current task. In the example of **FIG. 11**, four steps of the workflow model are visible. The lowest of the four steps is rendered with a highlighted border to indicate that it corresponds to the current history point **72**, i.e., the sixth.

[0166] **FIG. 11B** shows comment editing dialog **96** rendering the example task of **FIG. 11A**, but with a different history point **72** displayed. A caption on history bar **96***e* reads "5 of 6" to indicate the different position, and forward-moving navigation buttons are no longer grayed out, indicating that the new current history point **72** is not the last of the collection for this task. As with **FIG. 11A**, workflow tab **96***p* in **FIG. 11B** renders a visual representation of workflow model **58** with four steps visible. However, the lowest of the four steps is no longer rendered with a highlighted border. Instead, the highlighted border surrounds a different step, indicating that the fifth history point **72** for this task corresponds to a different step than the sixth.

[0167] **FIG. 11C** shows comment editing dialog **96** rendering the example task of **FIG. 11A**, but with selection tab **96***m* active instead of workflow tab **96***p*. In this mode, text area **96***h* presents discussion contribution **72***h* for viewing and editing, while selection tab **96***m* renders HTML text of the selection portion of the web page **42** associated with the task. By default, the checkbox labeled "View Source" is unchecked. In this case, selection tab **96***m* renders the text stored in selected area **78***c* as interpreted HTML output. Alternatively, when the user checks the checkbox labeled "View Source", selection tab **96***m* renders the text stored in selected area **78***c* as raw HTML source code.

[0168] Referring now to **FIG. 10B**, captured tab **96***n* provides statistical and technical information about the web page as it existed when the corresponding history point **72** was created. This includes the domain and URL of the page, the referring page's URL, the last revision date of the comment, and the software version of client application **24**. In addition, captured tab **96***n* lists information about the computing environment of client device **12** when the task was created, such as the platform, the software of the web browser, and the screen resolution of client device **12**. Client application **24** captures such information automatically when creating or modifying tasks.

[0169] Devices

[0170] Referring now to **FIG. 12**, client device **12** includes processor **12***a*, memory **12***b*, network interface **12***c*, input devices **12***d*, display device **12***e*, and bus **12***f*. Processor **12***a* executes instructions stored in memory **12***b*. For example, client application **24** is encoded as instructions stored in memory **12***b* that processor **12***a* executes. Input devices **12***d* include a typewriter keyboard and a computer mouse. Display device **12***e* is a computer screen, for example a cathode-ray tube or an LCD (liquid crystal display) or the like, for presenting a graphical user interface. Bus **12***f* passes communications between processor **12***a*, memory **12***b*, network interface **12***c*, input devices **12***d*, and display device **12***e*. Network interface **12***c* communicates with workflow network **14** and document network **18**.

[0171] Comment workflow server device **16** includes processor **16***a*, memory **16***b*, network interface **16***c*, bus **16***f*, and storage **16***g*. Processor **16***a* executes instructions stored in memory **16***b*. For example, comment workflow application **26** is encoded as instructions stored in memory **16***b* that processor **16***a* executes. Bus **12***f* passes communications between processor **12***a*, memory **12***b*, network interface **12***c*, and storage **16***g*. Storage **16***g* is a non-volatile machine-readable and machine-writable storage medium, such as a disk drive or flash memory. Storage **16***g* stores database **52**. Network interface **16***c* communicates with workflow network **14**

[0172] Document server device **20** includes processor **20***a*, memory **20***b*, network interface **20***c*, bus **20***f*, and storage **20***g*. Processor **20***a* executes instructions stored in memory **20***b*. For example, document server application **28** is encoded as instructions stored in memory **20***b* that processor **20***a* executes. Bus **12***f* passes communications between processor **12***a*, memory **12***b*, network interface **12***c*, and storage **20***g*. Storage **20***g* is a non-volatile machine-readable and machine-writable storage medium, such as a disk drive or flash memory. Storage **20***g* stores web pages **42**. Network interface **20***c* communicates with document network **18**.

[0173] Alternate Embodiments

[0174] A number of embodiments of the invention have been described. Nevertheless, it will be understood that various modifications may be made without departing from the spirit and scope of the invention. For example, workflow network **14** and document network **18** can be the same network.

[0175] In the described embodiment, document server application **28** serves web pages **42**, and tasks **62** track comments on and changes to the web pages **42**. In alternate embodiments, tasks **62** could refer to documents in other formats, for instance: text files, Adobe PDF (Portable Document Format) files; office files such as for Microsoft Word, Excel, PowerPoint and Visio; PostScript files; image and animation files in formats such as JPEG (Joint Photographic Experts Group), Flash, and Windows Media; or, in general, any file storable in an electronic format and transmissible between computers.

[0176] In the described embodiment, client application **24** communicates with comment workflow application **26** via XML and HTTP. In alternate embodiments, other network protocols could replace XML and HTTP and carry out similar functions. Furthermore, in the described embodiment, client application **24** and comment workflow application **26** run on different devices, but in alternate embodiments, client application **24** and comment workflow application **26** could run on the same device. Similarly, in the described embodiment, client application **24** and document server application **28** run on different devices, but in

alternate embodiments, client application **24** and document server application **28** could run on the same device. Moreover, in alternate embodiments, one or more of client application **24**, comment workflow application **26**, and document server application **28** could be run on multiple devices with distributed execution.

[0177] In the described embodiment, comment workflow application **26** uses CORBA standards for ORB **48**, but in alternate embodiments, ORB **48** could use another distributed object standard instead, for example DCOM (Distributed Common Object Model).

[0178] In the described embodiment, database **52** is a source of data that is accessible via ODBC, but in alternate embodiments, database **52** could be accessible via a different database interface standard, for example OLEDB (Object Linking and Embedding for Databases). Furthermore, in the described embodiment, database **52** includes tables that represent entities such as project **56**, domain **54**, workflow model **58**, tasks **62**, user profile **66**, role **68**, and history point **72**. The tables are one possible logical schema to represent the entities. In alternate embodiments, other underlying configurations of tables, views, or both could represent the entities.

[0179] In the described embodiment, a workflow model **58** cannot have more than one terminus step **74**. In alternate embodiments, workflow model can have more than one terminus step **74**.

[0180] Accordingly, other embodiments are within the scope of the following claims.

What is claimed is:

1. A computer-implemented method comprising:

rendering a web page in a browser control in a user interface;

detecting user input that selects a portion of the web page;

presenting a dialog in the user interface that detects user input of a markup to the portion of the web page; and

specifying a collection of users to notify of the markup.

2. The method of claim 1, further comprising:

generating a task entry that specifies the selected portion of the web page, the markup, and the collection of users to notify.

3. The method of claim 2, wherein the task entry also specifies a copy of the web page.

4. The method of claim 2, wherein the task entry also specifies the user that provided the user input.

5. The method of claim 2, wherein the task entry also specifies the approximate time that the user input was detected.

6. The method of claim 2, further comprising:

saving the task entry to a database of task entries.

7. The method of claim 1, wherein the dialog includes a collection of HTML editing controls that detect user input of the markup.

8. The method of claim 1, wherein the dialog detects user input requesting a rendering of the web page that incorporates the markup.

9. The method of claim 1, wherein the dialog renders a plurality of controls corresponding to a plurality of collections of users and wherein the dialog detects user input identifying the collection of users to notify from among the plurality of collections.

10. The method of claim 9, wherein the plurality of controls includes buttons.

11. The method of claim 9, wherein the plurality of controls includes entries in a list.

12. A computer-implemented method for markup workflow management, the method comprising:

loading a web page over a first logical network connection to a web server;

loading markup content for the web page over a second logical network connection to a workflow server different from the web server, where the markup content specifies changes to a target portion of the web page and has a resolution status relative to a workflow model;

if the resolution status indicates the markup content is unresolved, rendering the web page with an icon superimposed on the web page proximate to the target portion; and

if the resolution status indicates the markup content is resolved, rendering the web page with no alteration that indicates the markup content.

13. The method of claim 12, wherein rendering the web page with the icon superimposed includes detecting user interaction with the icon.

14. The method of claim 13, further comprising:

responding to detected user interaction with the icon by rendering a dialog containing the markup content.

15. A computer-implemented method for markup workflow management, the method comprising:

maintaining a database of unresolved tasks in a workflow project, each such task having a reference to a web page, a markup to a target portion of the web page, and an indication of a party responsible for working on the task next;

rendering a task from the database of unresolved tasks in a dialog that includes a display control, such that when a user activates the display control, the web page is rendered.

16. The method of claim 15, wherein the display control includes a list of unresolved tasks.

17. The method of claim 16, wherein the unresolved tasks indicate that the user is the party responsible for working on the tasks next.

18. The method of claim 15, wherein each such task also has a copy of the web page.

19. The method of claim 15, wherein each such task also has a resolution status that indicates whether work on the task is complete.

20. The method of claim 19, wherein if the resolution status indicates that work on the task is not complete, the web page is rendered with an icon superimposed on the web page near the target portion, and otherwise, if the resolution status indicates that work on the task is complete, the web page is rendered with no alteration that indicates the markup content.

21. An article comprising a machine-readable storage medium that stores executable instructions to perform markup workflow management, the instructions causing a machine to:

maintain a database of tasks in a workflow project, each such task having an address of a web page, a copy of the web page, a markup to a target portion of the web page, a resolution status within the workflow project, and an indication of a next party responsible for resolving the task.

22. A computer-implemented method for markup workflow management, the method comprising:

receiving, from a user, input that specifies a contribution to a discussion of a task and that includes a text description of the contribution, wherein the task describes a revision to a document and has a status according to a workflow model that specifies permissible states for the task;

assigning to the contribution a reference specifying the task and a time stamp indicating the approximate time the user input was received; and

passing the contribution to a database for storage.

23. The method of claim 22, wherein the user has a current user profile, and wherein assigning includes assigning to the contribution a reference to the current user profile.

24. A computer-implemented method for markup workflow management, the method comprising:

detecting user input specifying a task to render, wherein the task describes a revision to a document and has a status according to a workflow model that specifies permissible states for the task;

selecting from a database a plurality of contributions made by human users to a discussion of the task, each contribution having a text description of the contribution, a timestamp indicating when the contribution was made, and a reference specifying the task;

for a current contribution among the plurality of contributions, determining a corresponding state of the task based on the timestamp; and

visually rendering the task, the current contribution, and an indication of the corresponding state of the task.

* * * * *